

CHRISTINE DOUGHTY
Earth Sciences Division
Hydrogeology Department
E. O. Lawrence Berkeley National Laboratory

EDUCATION

- Ph.D.** 1995, (Material Science and Mineral Engineering), University of California, Berkeley.
Hydrologic characterization of heterogeneous geologic media using inverse methods based on iterated function systems.
- M.Sc.** 1991, (Material Science and Mineral Engineering), University of California, Berkeley.
Mathematical modeling of multi-phase fluid flow with heat transfer in geologic media.
- B.Sc.** 1978, (Engineering Physics), University of California, Berkeley.
Theoretical physics and mathematics with an emphasis on geosciences applications.

EXPERIENCE

Staff Scientist, Earth Sciences Division, Lawrence Berkeley Laboratory, Berkeley, CA, Mathematical modeling of the hydrothermal behavior of geothermal and petroleum reservoirs, aquifer and soil thermal energy storage systems, geologic sequestration of nuclear waste and carbon dioxide, and groundwater and vadose-zone contamination problems, 10/78 - Present.

Consultant, BP Exploration, Houston, TX, Petroleum resource evaluation 8/97-10/97, 6/02-9/02

Consultant, Oxbow Geothermal, Reno, NV, Geothermal resource evaluation 2/86 – 3/94

Technical Assistant, Energy and Environment Division, Lawrence Berkeley Laboratory, Berkeley, CA, Development of calculational meshes for numerical simulation of two-phase geothermal systems, 7/77 - 9/77.

HONORS

Undergraduate honors, University of California, Berkeley (1974-1978)

Achievement Rewards for College Scientists (ARCS) Foundation scholarship (1978)

Editors' citation for excellence in refereeing, Water Resources Research (1999)

LBNL award for excellence in technology transfer (2004)

LBNL award for outstanding performance (2006)

AFFILIATIONS

Member, Phi Beta Kappa

Member, American Geophysical Union

PATENTS

Patent number 4559818, December 1985

Thermal well-test method for determination of aquifer thermal and hydraulic properties.

CURRENT RESEARCH INTERESTS

Development and application of techniques for analyzing well-log, well-test, and tracer data to infer the distribution of hydrologic properties in heterogeneous geologic settings, including fractured rock; mathematical modeling of multi-component, multi-phase fluid flow and transport in heterogeneous geologic media; coordination of modeling studies with laboratory and field work; collaboration with geophysicists, geochemists, and geologists in interdisciplinary studies.

PUBLICATIONS

Journal Articles

1. Tsang, C.-F., T.A. Buscheck, and C. Doughty, Aquifer thermal energy storage: a numerical simulation of Auburn University field experiments, *Water Resour. Res.*, 17, 3, 647-658, 1981.
2. Doughty, C., G. Hellstrom, C.-F. Tsang, and J. Claesson, A dimensionless parameter approach to the thermal behavior of an aquifer thermal energy storage system, *Water Resour. Res.*, 18, 3, 571-587, 1982.
3. Buscheck, T.A., C. Doughty, and C.-F. Tsang, Prediction and analysis of a field experiment on a multilayered aquifer thermal energy storage system with strong buoyancy flow, *Water Resour. Res.*, 19, 5, 1307-1315, 1983.
4. Tsang, C.-F., D.C. Mangold, C. Doughty, and M.J. Lippmann, Prediction of reinjection effects in the Cerro Prieto geothermal system, *Geothermics*, 13, 1/2, 141-162, 1984.
5. Doughty, C. and C.-F. Tsang, A comparative study of a heat and fluid flow problem using three models of different levels of sophistication, *Mathematical Modelling*, 8, 412-418, 1987.
6. Doughty, C. and K. Pruess, A semianalytical solution for heat pipe effects near high-level nuclear waste packages buried in partially saturated geological media, *Intl. Journal of Heat and Mass Transfer*, 31, 1, 79-90, 1988.
7. Doughty, C. and K. Pruess, A similarity solution for two-phase fluid and heat flow near high-level nuclear waste packages emplaced in porous media, *Intl. Journal of Heat and Mass Transfer*, 33, 6, 1205-1222, 1990.
8. Doughty, C. and K. Pruess, A similarity solution for two-phase water, air, and heat flow near a linear heat source in a porous medium, *Journal of Geophysical Res.*, 97 (B2), 1821-1838, 1992.
9. Nir, A., C. Doughty, and C.-F. Tsang, Validation of design procedure and performance modeling of a heat and fluid transport field experiment in the unsaturated zone, *Advances in Water Resources*, 15, 153-166, 1992.
10. Amistoso, A.E., B.G. Aquino, Z.P. Aunzo, O.T. Jordan, F.X.M. Sta. Ana, G.S. Bodvarsson, and C. Doughty, Reservoir analysis of the Palinpinon geothermal field, Negros Oriental, Philippines, *Geothermics*, 22, (5/6), 555-574, 1993.
11. Doughty, C., J.C.S. Long, K. Hestir, and S.M. Benson, Hydrologic characterization of heterogeneous geologic media with an inverse method based on iterated function systems, *Water Resour. Res.*, 30, 6, 1721-1745, 1994.
12. Liu, H.H., C. Doughty, and G.S. Bodvarsson, An active fracture model for unsaturated flow and transport in fractured rocks, *Water Resour. Res.*, 34, 10, 2633-2646, 1998.
13. Doughty, C., Investigation of conceptual and numerical approaches for evaluating moisture, gas, chemical, and heat transport in fractured unsaturated rock, *Journal of Contaminant Hydrology*, 38, 1-3, 69-106, 1999.
14. Vasco, D.W., K. Karasaki, and C. Doughty, Using surface deformation to image reservoir dynamics, *Geophysics*, 65, 1, 1-16, 2000.
15. Johnson, T.M., R.C. Roback, T.L. McLing, T.D. Bullen, D.J. DePaolo, C. Doughty, R.J. Hunt, R.W. Smith, L.D. Cecil, and M.T. Murrell, Groundwater "fast paths" in the Snake River Plain aquifer: Radiogenic isotope ratios as natural groundwater tracers, *Geology*, 28, 10, 871-874, 2000.
16. Faybishenko, B., C. Doughty, M. Steiger, J.C.S. Long, T.R. Wood, J.S. Jacobsen, J. Lore, and P.T. Zawislanski, Conceptual model of the geometry and physics of water flow in a fractured basalt vadose zone, *Water Resour. Res.*, 36, 12, 3499-3520, 2000.

17. Doughty, C., Numerical model of water flow in a fractured basalt vadose zone, Box Canyon site, Idaho, *Water Resour. Res.*, 36, 12, 3521-3534, 2000.
18. Salve, R., J.S.Y. Wang, and C. Doughty, Liquid-release tests in unsaturated fractured welded tuffs: I. Field investigations, *Journal of Hydrology*, 256, 1-2, 60-79, 2002.
19. Doughty, C., R. Salve, and J.S.Y. Wang, Liquid-release tests in unsaturated fractured welded tuffs: II. Numerical modeling, *Journal of Hydrology*, 256, 1-2, 80-105, 2002.
20. Doughty, C. and K. Karasaki, Flow and transport in hierarchically fractured rock, *Journal of Hydrology*, 263, 1-4, 1-22, 2002.
21. Tsang, C.-F. and C. Doughty, A particle-tracking approach to simulating transport in a complex fracture, *Water Resour. Res.*, 39, 7, 1174, doi:10.1029/2002WR001614, 2003.
22. Tsang, C.-F. and C. Doughty, Multirate flowing fluid electric conductivity logging method, *Water Resour. Res.*, 39, 12, 1354, doi:10.1029/2003WR002308, 2003.
23. Doughty, C. and K. Karasaki, Modeling flow and transport in saturated fractured rock to evaluate site characterization needs, *IAHR Journal of Hydraulics*, 42, extra issue, 33-44, 2004.
24. Doughty, C. and K. Pruess, Modeling supercritical carbon dioxide injection in heterogeneous porous media, *Vadose Zone Journal*, 3, 3, 837-847, 2004.
25. Doughty, C. and C.-F. Tsang, Signatures in flowing fluid electric conductivity logs, *Journal of Hydrology*, 310, 1-4, 157-180, 2005.
26. Doughty, C., S. Takeuchi, K. Amano, M. Shimo, and C.-F. Tsang, Application of multi-rate flowing fluid electric conductivity logging method to Well DH-2, Tono Site, Japan, *Water Resour. Res.*, 41, W1041, doi:10.1029/2004WR003708, 2005.
27. Hovorka, S.D., S.M. Benson, C. Doughty, B.M. Freifeld, S. Sakurai, T.M. Daley, Y.K. Kharaka, M.H. Holtz, R.C. Trautz, H.S. Nance, L.R. Myer, and K.G. Knauss, Measuring permanence of CO₂ storage in saline formations: the Frio experiment, *Environmental Geosciences*, 13, 2, 1-17, 2006.
28. Doughty, C., Modeling geologic storage of carbon dioxide: comparison of hysteretic and non-hysteretic curves, *Energy Conversion and Management*, 48, 6, 1768-1781, doi:10.1016/j.enconman.2007.01.022, 2007.
29. Doughty, C., B.M. Freifeld, and R.C. Trautz, Site characterization for CO₂ geologic storage and vice versa – the Frio brine pilot, Texas, USA as a case study, *Environmental Geology*, 54, 8, 1635-1656, doi: 10.1007/s00254-007-0942-0, 2008.
30. Finsterle, S., C. Doughty, M.B. Kowalsky, G.J. Moridis, L. Pan, T. Xu, Y. Zhang, and K. Pruess, Advanced vadose zone simulation using TOUGH, *Vadose Zone Journal*, 7, 601–609, doi:10.2136/vzj2007.0059, 2008.
31. Doughty, C., C.-F. Tsang, K. Hatanaka, S. Yabuuchi, and H. Kurikami, Application of direct-fitting, mass-integral, and multi-rate methods to analysis of flowing fluid electric conductivity logs from Horonobe, Japan, *Water Resour. Res.*, 44, W08403, doi:10.1029/2007WR006441, 2008.
32. Tsang, C.-F., C. Doughty, and M. Uchida, Simple model representations of transport in a complex fracture and their effects on long-term predictions, *Water Resour. Res.*, 44, W08445, doi:10.1029/2007WR006632, 2008.
33. Doughty, C., Estimating plume volume for geologic storage of CO₂ in saline aquifers, *Ground Water*, 46, 6, 810-813, 2008.
34. Doughty, C., Investigation of CO₂ plume behavior for a large-scale pilot test of geologic carbon storage in a saline formation, *Transport in Porous Media*, special issue on geologic carbon storage, doi:10.1007/S112423-009-9396-z, 2009.

35. Tsang, C.-F. and C. Doughty, Insight from simulations of single-well injection-withdrawal tracer tests on simple and complex fractures, submitted to Water Resour. Re., June, 2009.
36. Doughty, C. and C.-F. Tsang, Analysis of three sets of SWIW tracer-test data using a two-population complex fracture model, submitted to Geophysical Research Letters, June, 2009.
37. Doughty, C., C.-F. Tsang, S. Yabuuchi, and T. Kunimaru, Simultaneous determination of hydraulic properties of multiple fractures in borehole PB-V01, Horonobe, Japan and identification of fractures with natural flow, in preparation, June, 2009.

Books and Book Chapters

1. Javandel, I., C. Doughty, and C.-F. Tsang, Groundwater Transport: handbook of mathematical models, 228 pp., Water resources monograph 10, American Geophysical Union, Washington D.C., 1984.
2. Long, J.C.S., C. Doughty, K. Hestir, and S. Martel, Modeling heterogeneous and fractured reservoirs with inverse methods based on Iterated Function Systems, in Reservoir characterization III, Bill Linville, Editor, PennWell Books, Tulsa, Oklahoma, 1993.
3. Long, J.C.S., C. Doughty, A. Datta-Gupta, K. Hestir, and D.W. Vasco, Component characterization: An approach to fracture hydrogeology, in Subsurface flow and transport: a stochastic approach, G. Dagan and S.P. Neuman, Editors, Cambridge University Press, New York, 1997.
4. Benito, P.H., P.J. Cook, B. Fayishenko, B. Freifeld, and C. Doughty, Cross-well air-injection parcker tests for the assessment of pneumatic connectivity in fractured, unsaturated basalt, in Rock mechanics for industry, Proceedings of the 37th U.S. Rock Mechanics Symposium, Vail, Colorado, USA, June 6-9, 1999, B. Amadei, R.L. Kranz, G.A. Scott and P.H. Smealie, Editors, 843-851, A.A. Balkema, Rotterdam, 1999.
5. Doughty, C. and B. Faybishenko, Modeling of water flow and tracer breakthrough curves in fractured basalt (lessons learned and future investigations), in Vadose zone science and technology solutions, B.B. Looney and R.W. Falta, Editors, Battelle Memorial Institute, Columbus, Ohio, 2000.
6. Faybishenko, B., P. A. Witherspoon, C. Doughty, J.T. Geller, T.R. Wood, and R.K. Podgorney, Multi-scale investigations of liquid flow in a fractured basalt vadose zone, in Flow and transport through unsaturated fractured rock, second edition, D.D. Evans, T.J. Nicholson, and T.C. Rasmussen, Editors, Geophysical Monograph 42, 161-182, American Geophysical Union, Washington D.C., 2001.
7. Hovorka, S.D., C. Doughty, S.M. Benson, K. Pruess, and P.R. Knox, The impact of geological heterogeneity on CO₂ storage in brine formations: a case study from the Texas Gulf Coast, In Geological storage of carbon dioxide, S.J. Baines and R.H. Worden, Editors, Special Publication 233, 147-163, Geological Society, London, 2004.
8. Tsang, C.-F., C. Doughty, J. Rutqvist, and T. Xu, Modeling to understand and simulate physico-chemical processes of CO₂ geological storage, In Carbon capture and geologic sequestration: Integrating technology, monitoring, and regulation, E.J. Wilson and D. Gerard, Editors, Blackwell Publishing, Ames, Iowa, 2007.
9. Doughty, C. and L.R. Myer, Scoping calculations on leakage of CO₂ in geologic storage, in Science and technology of carbon sequestration, B. McPherson and E. Sundquist, Editors, American Geophysical Union, Washington DC, in press, 2009.

Thesis and Dissertation

Doughty, C., Two phase fluid and heat flow in fractured/porous media: a similarity solution, M.Sc. Thesis, Department of Materials Science and Mineral Engineering, University of Calif., Berkeley, 1991.

Doughty, C., Estimation of hydrologic properties of heterogeneous geologic media with an inverse method based on iterated function systems, Ph.D. Dissertation, Department of Materials Science and Mineral Engineering, University of Calif., Berkeley, 1995 (LBL-38136).

Conference Papers and Presentations

1. Tsang, C.-F., T.A. Buscheck, and C. Doughty, Aquifer thermal energy storage - recent parameter and site-specific studies, in Proceedings, International Conference: Seasonal Thermal and Compressed Air Energy Storage, Seattle, Washington, October 19-21, 1981.
2. Tsang, C.-F., D.C. Mangold, C. Doughty, and M.J. Lippmann, The Cerro Prieto reinjection tests: studies of a multilayer system, in Proceedings, Third Symposium on the Cerro Prieto Geothermal Field, San Francisco, Calif., March 24-26, 1981.
3. Tsang, C.-F. and C. Doughty, A non-isothermal well test analysis method, in Proceedings, ASME-JSME Thermal Engineering Conference, Honolulu, Hawaii, March 20-24, 1983.
4. Doughty, C. and C.-F. Tsang, Control of the movement of a fluid plume by injection and production procedures in Proceedings, ASME-JSME Thermal Engineering Conference, Honolulu, Hawaii, March 20-24, 1983.
5. Tsang, C.-F., D.C. Mangold, C. Doughty, and I. Javandel, A study of contaminant plume control in fractured-porous media, in Proceedings, National Water Well Convention, Columbus, Ohio, May 22, 1983.
6. Doughty, C., A. Nir, C.-F. Tsang, and G.S. Bodvarsson, Heat storage in unsaturated soils - initial theoretical analysis of storage design and operational methods, in Proceedings, International Conference on Subsurface Heat Storage in Theory and Practice, Stockholm, Sweden, June 6-8, 1983.
7. Tsang, C.-F. and C. Doughty, Detailed validation of a liquid and heat flow code against field performance, SPE-13503, in Proceedings, Eighth SPE Symposium on Reservoir Simulation, Dallas, Texas, Feb. 10-13, 1985.
8. Doughty, C. and C.-F. Tsang, Investigation of the vertical-flow aquifer thermal energy storage concept and numerical simulation of the Dorigny field experiment, in Proceedings, Third International Conference on Energy Storage for Building Heating and Cooling, Toronto, Canada, Sept. 22-26, 1985.
9. Nir, A., C. Doughty, and C.-F. Tsang, Seasonal heat storage in unsaturated soils: example of design study, in Proceedings, 21st Intersociety Energy Conversion Engineering Conference, San Diego, Calif., August 25-29, 1986.
10. Bensabat, J., C. Doughty, E. Korin, A. Nir, and C.-F. Tsang, Validation experiments of seasonal thermal energy storage models in unsaturated soils, presented at Jigastock 88, Journees internationales sur le stockage de l'energie thermique et la geothermie appliquee, Versailles, France, October 17-20, 1988.
11. Doughty, C. and K. Pruess, A similarity solution for two-phase fluid and heat flow near high-level nuclear waste packages emplaced in porous media, presented at Fall AGU Meeting, San Francisco, December, 1988.
12. Doughty, C. and K. Pruess, Verification of TOUGH2 against a semianalytical solution for transient two-phase fluid and heat flow in porous media, presented at The TOUGH Workshop, Lawrence Berkeley Lab., Berkeley, Calif., September 13-14, 1990.
13. Doughty, C., C.-F. Tsang, E. Korin, and A. Nir, Seasonal storage of thermal energy in unsaturated soils: modeling, simulation, and field validation, presented at Thermastock '91, fifth International Congress on Thermal Energy Storage, Scheveningen, The Netherlands, May 13-16, 1991.
14. Doughty, C. and K. Pruess, A mathematical model for two-phase water, air, and heat flow around a linear heat source emplaced in a permeable medium, presented at The 1991 ASME/AIChE National Heat Transfer Conference, Minneapolis, Minnesota, July 28-31, 1991, Rep. LBL-30050, Lawrence Berkeley Lab., Berkeley, Calif., 1991.

15. Doughty, C., J.C.S. Long, and K. Hestir, Characterization of heterogeneous geologic media using inverse methods on models with hierarchical structure, presented at Fall AGU Meeting, San Francisco, December, 1991.
16. Doughty, C., Hydrological inversions using Iterated Function Systems, Invited talk, SIAM Conference on Mathematical and Computational Issues in the Geosciences, Houston, Texas, April 19-21, 1993.
17. Doughty, C., J.C.S. Long, E.L. Majer, T.M. Daley, J.E. Peterson Jr., and L.R. Myer, LBL/Industry heterogeneous reservoir performance definition project - Gypsy site, presented at BPO Contractor Review Conference, Fountainhead, Oklahoma, July 18-22, 1993.
18. Doughty, C. and J.T. Geller, Effects of degassing on aqueous flow in fractures: dynamic versus equilibrium behavior, Invited presentation, Two-phase Flow in Fractures Workshop, Berkeley, Calif., November 3-4, 1993.
19. Merzlyakov, E., C. Doughty, and A. Nir, Analytical approximation of a design of a seasonal thermal energy storage in a semi-arid zone, in Proceedings, Sixth International Conference on Thermal Energy Storage, Espoo, Finland, August 22-25, 1994.
20. Long, J.C.S., C. Doughty, D.W. Vasco, A. Datta-Gupta, K. Hestir, E.L. Majer, and J.E. Peterson Jr., Fractured reservoir characterization through inverse analysis of well-test data and seismic imaging, presented at SEG 64th Annual Meeting, Los Angeles, Calif., October 23-28, 1994.
21. Doughty, C. and J.C.S. Long, Characterization of heterogeneous geologic media at the scale of interest for applications, presented at Fall AGU Meeting, San Francisco, December, 1994.
22. Doughty, C., Flow reduction due to degassing and redissolution phenomena, presented at The TOUGH Workshop, Lawrence Berkeley National Lab., Berkeley, Calif., March 20-22, 1995.
23. Geller, J.T., C. Doughty, and J.C.S. Long, Two-phase flow in regionally saturated fractured rock near excavations, presented at the 6th Annual International High-Level Radioactive Waste Management Conference and Exposition, Las Vegas, Nevada, April 30-May 5, 1995.
24. Datta-Gupta, A., E.L. Majer, J.E. Peterson Jr., D.W. Vasco, C. Doughty, J.C.S. Long, J. Queen, P.S. D'Onfro, and W.D. Rizer, An integrated approach to characterization of fractured reservoirs, presented at SEG 65th Annual Meeting, Houston, Texas, October, 1995.
25. Faybishenko, B., J.C.S. Long, C. Doughty, R. Salve, P. Zawislanski, J. Jacobsen, and J.B. Sisson, Investigations of scale effects and preferential flow in the vadose zone of fractured basalt at Box Canyon analog site in Idaho, presented at GSA Fall Meeting, Denver, Colorado, October, 1996.
26. Faybishenko, B., J.C.S. Long, J.B. Sisson, C. Doughty, R. Salve, K. Williams, P. Zawislanski, and J. Jacobsen, Field ponded infiltration test in fractured basalt at Box Canyon analog site in Idaho: Summary of preliminary results, presented at AGU Fall Meeting, San Francisco, December, 1996.
27. Doughty, C., Hydrogeologic characterization using the iterated function system (IFS) inverse method, presented at the Joint USAF/Army Contractor/Grantee Meeting, Panama City, Florida, January 14-17, 1997.
28. Wood, T.R., T.M. Stoops, B. Faybishenko, C. Doughty, and J.S. Jacobsen, A conceptual model of tracer transport in fractured basalt: Large scale infiltration test revisited, presented at GSA Fall Meeting, Salt Lake City, Utah, October, 1997.
29. Faybishenko, B., C. Doughty, J.C.S. Long, and T.R. Wood, Conceptual model of geometry and physics of liquid flow in unsaturated fractured basalt at Box Canyon site, presented at AGU Fall Meeting, San Francisco, December, 1997.
30. Doughty, C., Numerical modeling of hot air injection and ponded infiltration tests in unsaturated fractured basalt at the Box Canyon site, presented at AGU Fall Meeting, San Francisco, December, 1997.

31. Oldenburg, C.M. and C. Doughty, Data fusion and inverse modeling for SELECT, in Proceedings, Air Force Office of Scientific Research Annual Review, Snowbird, Utah, May, 1998.
32. Doughty, C., Numerical modeling of field tests in unsaturated fractured basalt at the Box Canyon site, presented at TOUGH Workshop '98, Berkeley, Calif., May, 1998, Rep. LBNL-41920, Lawrence Berkeley National Lab., Berkeley, Calif., 1998.
33. Sahoo, D., T.M. Johnson, and C. Doughty, Utilizing natural Sr isotope ratios to determine preferential flow paths in subsurface aquifers on a regional scale, presented at AGU Spring Meeting, Boston, May, 1998.
34. Johnson T.M., D. Sahoo, T.L. McLing, C. Doughty, D.J. DePaolo, and R.W. Smith, EM/ER project: Investigation of groundwater flow paths through combined inversion of strontium isotope ratios and hydraulic head data, U.S. Dept. of Energy Environmental Management Science Program Workshop, Chicago, IL, July, 1998.
35. Faybishenko, B., P.A. Witherspoon, C. Doughty, T.R. Wood, R.K. Podgorney, and J.T. Geller, Multi-scale conceptual approach to describe flow in a fractured vadose zone, presented at AGU Fall Meeting, San Francisco, December, 1998.
36. Li, J.H. and C. Doughty, Forward and backward particle tracking on earth-ocean-atmosphere joint simulation, presented at AGU Fall Meeting, San Francisco, December, 1999.
37. Hovorka, S.D., C. Doughty, P.R. Knox, C.T. Green, K. Pruess, and S.M. Benson, Evaluation of brine-bearing sands of the Frio Formation, upper Texas Gulf Coast for geological sequestration of CO₂, presented at First National Conference on Carbon Sequestration, National Energy Technology Lab., Washington DC, May 14-17, 2001.
38. Doughty, C., K. Pruess, S.M. Benson, S.D. Hovorka, P.R. Knox, and C.T. Green, Capacity investigation of brine-bearing sands of the Frio Formation for geologic sequestration of CO₂, presented at First National Conference on Carbon Sequestration, National Energy Technology Lab., Washington DC, May 14-17, 2001.
39. Doughty, C. and K. Karasaki, Modeling flow and transport in saturated fractured rock to evaluate site characterization needs, presented at 2002 IAHR International Groundwater Symposium, Berkeley, Calif., March 25-28, 2002.
40. Salve, R., C. Doughty, and J.S.Y. Wang, Measuring and modeling flow in welded tuffs, presented at 2002 IAHR International Groundwater Symposium, Berkeley, Calif., March 25-28, 2002.
41. Myer, L.R., S.M. Benson, C. Byrer, D. Cole, C. Doughty, W. Gunter, G.M. Hoversten, S. Hovorka, J.W. Johnson, K. Knauss, A. Kovscek, D. Law, M.J. Lippmann, E.L. Majer, B. van der Meer, G. Moline, R.L. Newmark, C.M. Oldenburg, F.M. Orr, Jr., K. Pruess, C.-F. Tsang, The GEO-SEQ project; A status report, presented at GHGT-6 Conference, Kyoto, Japan, September 30 – October 4, 2002.
42. Doughty, C., S.M. Benson, and K. Pruess, Capacity investigation of brine-bearing sands for geologic sequestration of CO₂, presented at GHGT-6 Conference, Kyoto, Japan, September 30 – October 4, 2002.
43. Doughty, C. and K. Karasaki, Using borehole temperature profiles to constrain regional groundwater flow, presented at AGU Fall Meeting, San Francisco, December, 2002.
44. Doughty, C. and K. Karasaki, Constraining hydrologic models using thermal analysis, presented at Rock Mechanics Symposium, Japan Society of Civil Engineers, Tokyo, Jan. 23-24, 2003.
45. Knox, P.R., C. Doughty, and S.D. Hovorka, Impacts of buoyancy and pressure gradient on field-scale geological sequestration of CO₂ in saline aquifers, presented at AAPG Annual Meeting, Salt Lake City, May 11-14, 2003.

46. Doughty, C., K. Pruess, and S.M. Benson, Development of a well-testing program for a CO₂ sequestration pilot in a brine formation, presented at Second National Conference on Carbon Sequestration, National Energy Technology Lab., Alexandria, Virginia, May 5-8, 2003.
47. Myer, L.R., S.M. Benson, C. Doughty, S.D. Hovorka, G.M. Hoversten, E.L. Majer, K. Pruess, K. Knauss, T. Phelps, D. Cole, P. Knox, W. Gunter, R. Newmark, D. Vasco, W. Foxall, Monitoring and verification at the Frio pilot test, presented at Second National Conference on Carbon Sequestration, National Energy Technology Lab., Alexandria, Virginia, May 5-8, 2003.
48. Doughty, C. and K. Pruess, Modeling supercritical CO₂ injection in heterogeneous porous media, presented at TOUGH Symposium 2003, Lawrence Berkeley National Lab., Berkeley, Calif., May 12-14, 2003.
49. Doughty, C. and C.-F. Tsang, Hydrologic characterization of fractured rock using flowing fluid electric conductivity logs, presented at Second International Symposium on Dynamics of Fluids in Fractured Rock, Lawrence Berkeley National Lab., Berkeley, Calif., February 10-12, 2004.
50. Doughty, C. and K. Karasaki, Constraining a fractured-rock groundwater flow model with pressure-transient data from an inadvertent well test, presented at Second International Symposium on Dynamics of Fluids in Fractured Rock, Lawrence Berkeley National Lab., Berkeley, Calif., February 10-12, 2004.
51. Takeuchi, S., M. Shimo, C. Doughty, and C.-F. Tsang, Identification of the water-conducting features and evaluation of hydraulic parameters using fluid electric conductivity logging, presented at Second International Symposium on Dynamics of Fluids in Fractured Rock, Lawrence Berkeley National Lab., Berkeley, Calif., February 10-12, 2004.
52. Holtz, M.H., C. Doughty, J. Yeh, and S.D. Hovorka, Modeling of CO₂ saline aquifer sequestration and the effects of residual phase saturation, presented at AAPG Annual Meeting, Dallas, April 18-21, 2004.
53. Doughty, C., K. Pruess, S.M. Benson, B.M. Freifeld, and W.D. Gunter, Hydrological and geochemical monitoring for a CO₂ sequestration pilot in a brine formation, presented at Third National Conference on Carbon Sequestration, National Energy Technology Lab., Alexandria, Virginia, May 3-6, 2004.
54. Myer, L.R., S.M. Benson, D. Cole, T. Daley, C. Doughty, A. Dutton, B. Freifeld, W. Gunter, M. Holtz, S. Hovorka, M. Hoversten, B.M. Kennedy, Y. Kharaka, K. Knauss, P. Knox, E. Majer, T. Phelps, K. Pruess, J. Robinson, Subsurface monitoring and verification at the Frio pilot test, presented at Seventh International Conference on Greenhouse Gas Control Technologies (GHGT-7), IEA Greenhouse Gas R&D Programme, Vancouver, Canada, September 5-9, 2004.
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